Active Project (2015 - 2017)

Architecture Framework for Fault Management Assessment and Design (AFFMAD), Phase II Project

SBIR/STTR Programs | Space Technology Mission Directorate (STMD)

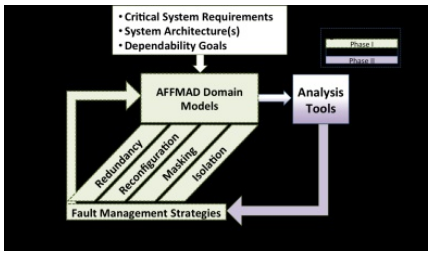
ABSTRACT

Architecture Framework for Fault Management Assessment And Design(AFFMAD) provides Fault Management (FM) trade space exploration and rigorous performance constraint checking for FM strategies of complex cyber-physical systems. AFFMAD will assist early evaluation of FM strategies and improve the efficiency of implementing and testing those strategies much earlier in the design process than today. With AFFMAD, FM engineers will be able systematically generate, analyze, and trade-off FM strategies at the system-level within a multi-discipline modeling framework. Focusing on the early design phases will reduce the technical, schedule, and cost risk of Science Mission Directorate (SMD) missions. A key innovation of the AFFMAD approach is to represent the FM models in a form that supports iteration over alternative FM strategies in order to optimize overall mission success. We accomplish this by building abstract FM cyber-physical models, annotating them with both FM characteristics and mission costs (e.g., Size, Weight, and Power (SWAP), latency, throughput), and using external tools to iteratively explore the state space of feasible FM strategies. At each iteration, AFFMAD collects performance and cost information about each alternative in the context of each mission phases as well as the entire mission.

ANTICIPATED BENEFITS

To NASA funded missions:

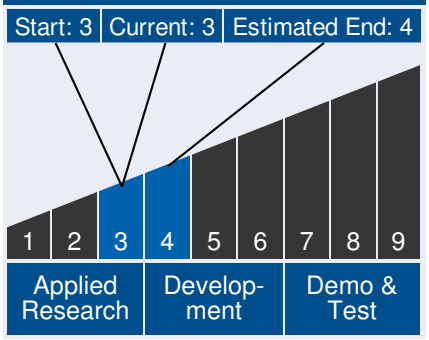
Potential NASA Commercial Applications: The initial target application for this work is to support NASA missions that involve Autonomous Rendezvous and Docking (ARD), and specifically the systems engineers who design the FM aspects of the system. However AFFMAD is a FM design tool, and as such, it can be adapted to address any whole system (aircraft, spacecraft, or surface exploration vehicle) or sub-system thereof.



Architecture Framework for Fault Management Assessment and Design (AFFMAD)

Table of Contents

Technology Maturity



Management Team

Program Executives:

- Joseph Grant
- Laguduva Kubendran

Program Manager:

- Carlos Torrez

Continued on following page.

Architecture Framework for Fault Management Assessment and Design (AFFMAD), Phase II Project

To the commercial space industry:

Potential Non-NASA Commercial Applications: FM is a key strategy used by many industries to increase system dependability, and FM failures are concerns for any organization designing or building life- or mission-critical systems. Other potential government customers include the Army, Air Force, Navy, and Department of Energy. Likely customers from the commercial sector include those in the aviation, process control and medical device industries. DoD system design and development efforts are expected to greatly benefit from the AFFMAD work. AFFMAD will facilitate future Army ground vehicle developments by assisting FM engineers' early evaluation of FM strategies and improving the efficiency of implementing and testing those strategies. AFFMAD will also facilitate Army air vehicle developments. Adventium, as a contractor for the Army JMR program under the FVL initiative, is providing advanced model-based system engineering methods and tools to address early design and defect detection issues. The first new FVL vehicle is likely to be a new medium-lift replacement for BlackHawk and Apache class helicopters to be introduced around 2030. We are helping develop advanced model-based system engineering methods to support both government requirements engineering and supplier developments.

Management Team *(cont.)*

Principal Investigator:

- Todd Carpenter

Technology Areas

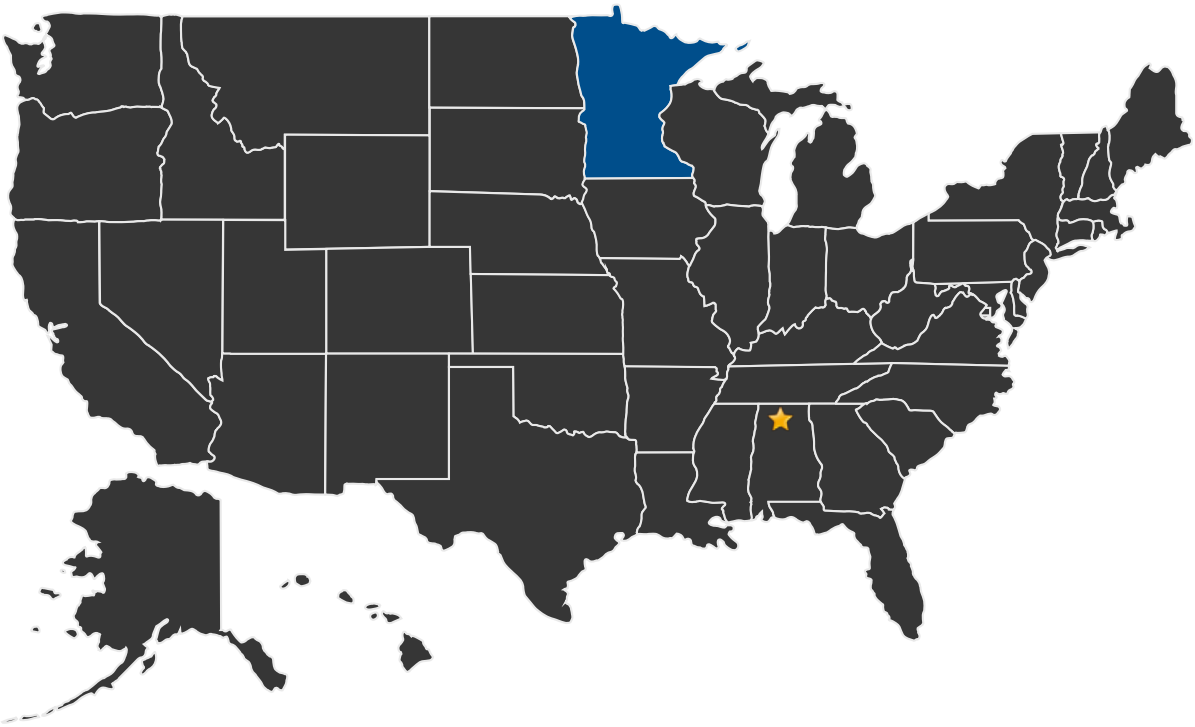
Primary Technology Area:
Modeling, Simulation, Information Technology and Processing (TA 11)
- Modeling (TA 11.2)
  - Integrated Hardware and Software Modeling (TA 11.2.2)
    - Automated Design Specification Knowledge Capture System (TA 11.2.2.3)

Secondary Technology Area:
Robotics and Autonomous Systems (TA 4)
- Autonomous Rendezvous and Docking (TA 4.6)

Architecture Framework for Fault Management Assessment and Design (AFFMAD), Phase II Project

SBIR/STTR Programs | Space Technology Mission Directorate (STMD)

U.S. WORK LOCATIONS AND KEY PARTNERS



U.S. States With Work

Lead Center:
Marshall Space Flight Center

Other Organizations Performing Work:

- Adventium Enterprises, LLC (Minneapolis, MN)

PROJECT LIBRARY

Presentations

- Briefing Chart
  - (http://techport.nasa.gov:80/file/18060)

DETAILS FOR TECHNOLOGY 1

Technology Title

Architecture Framework for Fault Management Assessment and Design (AFFMAD)